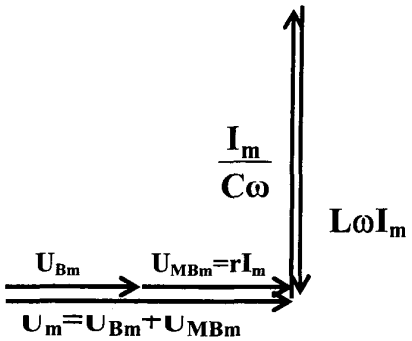

Circuit resistant: $Z = (R + r)$

$U_m = (R + r)\, I_n = 4$ v

$U_{Rm} = RI_m = 2$ V $\Rightarrow$ $I_m = \frac{0,2}{10} = 0,2$ A

$U_{MB_m} = rI_n = 2$ V

b- $i(t) = I_m$ si $(\omega t + \varphi_i) = 0,2 \sin(\omega_0 t + \varphi_u)$

$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{0,6.1,5.10^{-6}}} = 1054$ rad.s^{-1}

$\varphi_i = \varphi_u = \pi$

$i(t) = 0,2$ si $(1054t + \pi)$

c- $E_{\text{consommée}} = \mathcal{P}.T = (R + r).\frac{I_m^2}{2}.\frac{2\pi}{\omega_0}$

$E_{\text{consommée}} = 20.\frac{(0,2)^2}{2}.\frac{2\pi}{1054} = 2,38.10^{-3}$ J

d- $E = Ec + E_L$

$E = \frac{1}{2}\frac{q^2}{C} + \frac{1}{2}Li^2$

$\Rightarrow \frac{dE}{dt} = \frac{1}{2C}(2qi) + \frac{1}{2}L\left(2\frac{di}{dt}\right) = \frac{q}{C}i + Li\frac{di}{dt}$

$\Rightarrow \frac{dE}{dt} = i\left(\frac{q}{C} + L\frac{di}{dt}\right)$

Loi des mailles :

$u_B + u_R + u_c = u$

$\Rightarrow L\frac{di}{dt} + (R + r)i + \frac{q}{C} = c \Rightarrow L\frac{di}{dt} + \frac{q}{C} = u - (R + r)i$

donc $\frac{dE}{dt} = i(u - (R + r)i)$

$$\begin{cases} u = U_n \sin(\omega_0 t + \varphi_u) \\ (R + r) = (R + r)\, I_m \sin(\omega_0 t + \varphi_i) \\ \omega = \omega_0 \end{cases} \Rightarrow \begin{cases} U_m = (r + R)\, I_m \\ \varphi_a = \varphi_i \end{cases}$$

$\rightarrow u - (R + r)\, i = 0$

$\rightarrow \frac{dE}{dt} = 0 \rightarrow$ E = constante

$E = \frac{1}{2}L\, I_m^2 = \frac{1}{2}.\, 0,6.(0,2)^2$

E = 0,012J